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ABSTRACT

This paper utilizes a literature review and survey as the basis for comments about the influence of schoolyards on academic learning and child development. The researchers find that school grounds form an important albeit under-utilized part of the built environment. School grounds have a positive impact on social development, academic achievement, and safety and physical well-being. The study also suggests characteristics that constitute outstanding schoolyards. It assesses the state of research on school grounds and presents a critique of existing knowledge. Appendices contain a partial bibliography, the survey on the impact of schoolyard learning programs, survey data, and a survey research summary table. (GR)

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Schoolyard Learning: The Impact of School Grounds

A research paper by Education Development Center, Inc. and the Boston Schoolyard Funders Collaborative

November, 2000

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1. INTRODUCTION

The Boston Schoolyard Funders Collaborative and Education Development Center, Inc. (EDC) have produced the white paper "*Schoolyard Learning: the Impact of School Grounds*" to meet the needs of those interested in knowing more about the effect of schoolyard programs on academic learning and child development. Across the United States and in countries around the world there is growing recognition that outdoor education can play an important role in both formal and informal learning systems; and that school grounds offer an outdoor educational environment that is most immediately accessible to students on a daily basis.

A growing cadre of concerned educators, landscape architects, parents and community groups have been undertaking more deliberate efforts to make school grounds an integral part of the classroom experience. This white paper was commissioned to look at what has been learned to date from these efforts, and to make recommendations to further strengthen the linkages between school grounds, learning, and child development.

The paper, drawing from the literature and the views of school grounds experts, suggests a cluster of characteristics that are indicative of high performing schoolyards. For example, an effective schoolyard is usually designed through a collaborative process involving educators, landscape design specialists, community residents, and students themselves. Such a schoolyard has multiple uses, including developmentally appropriate play and learning activities. It is integrated into the school's curriculum and educational planning process; and establishes a "culture of use" that ensures the sustainability and continuity of activities and benefits from year to year.

EDC and the Boston Schoolyard Funders Collaborative then asked the question, "To what extent is there information that can correlate the characteristics of well designed schoolyards with improved learning and child development?" To answer this question a review of the literature on school ground programs was undertaken, and a survey conducted among over 100 currently active school grounds programs.

What we found was that well designed school ground programs appear to make a big difference in academic performance and child development. However, almost all the evidence for making such a case is purely impressionistic, deriving from the observations of program designers and implementers. There was a marked absence of rigorous data that would validate a case to policy-makers for increased investment in school ground activities.

Based on the conclusions of this paper, we believe that carrying out a well designed school grounds policy research study is greatly needed. The design parameters for such a study are outlined in the final section of the paper.

We hope the publication of this paper prompts increased interest in the relationship between well designed and managed school ground programs, academic learning, and child development. We welcome any feedback and comments that readers want to provide.

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1.1 Purpose of the Study

In 1999, the Boston Schoolyard Funders Collaborative (BSFC) received a grant, from the Nellie Mae Foundation, to explore the benefits of re-vitalizing public schoolyards. The BSFC contracted the Educational Development Center (EDC) to conduct a "search & survey" analysis of what types of schoolyard programming currently exist in this country and abroad. The results of this outreach campaign, contained in this document, were not entirely unexpected. The high degree of enthusiasm from practitioners, the ad hoc nature of many programs, limited funding and institutional support, and the lack of structured and quantifiable schoolyard research are all issues that we've encountered in constructing the Boston model. Our hope is that this baseline analysis will help define an emerging network of schoolyard advocates and will assist us in framing our next steps toward integrating these valuable open spaces into our educational ecosystem.

1.2 Definition and Functions of a Quality Schoolyard

A school's campus is made up of buildings and grounds. The schoolyard is the space outside the building or the school's external environment. A school's buildings and grounds are also part of the surrounding community and each has an impact on the other. An unimproved or degraded schoolyard sends a negative message about the school and the neighborhood in which it is situated. A dynamic and active schoolyard adds to the vibrancy of both. All schools have schoolyards, whether big or small, beautiful or ugly, actively used or abandoned. The question becomes, how do we develop this potential asset into a space that is put to its highest use? The ideal schoolyard is designed to address three areas of activity:

• Recreation and Physical Education - The development of motor skills, physical fitness, the ability to work & play together in groups, and enhanced self-esteem are a few benefits seen from the installation of play structures, physical challenge courses, and properly maintained fields and courts. Many schools lack adequate gymnasium space and students will expend their energies in the hallways or classrooms if not given a more appropriate outlet. During out-of-school time, facilities should be open to neighborhood youth and families, local sports leagues, and summer camps.

• Social Development - Part of learning and growing up involves the ability to function in a group setting. In the schoolyard, whether formally or informally, youth have the opportunity to form groups, reach consensus, and develop critical thinking and problem-solving skills with their peers. These interactive skills will aid students as they enter the "real world" where the ability to cooperate with colleagues in the workplace may be more important than remembering the Pythagorean theorem. Although a sad commentary, it is true that many urban youth are not allowed outside their houses or apartments without close adult supervision. Working parents instruct their children to come home from school and lock the doors behind them. Supervised time in the schoolyard may be the only opportunity children have to be outdoors. Expanded access through outdoor classes, after school programs and summer camps will address this very basic human need.

• Academic Learning - Outdoor, experiential learning is a teaching methodology that can add a new dimension to public education. Any subject that can be taught inside a classroom can be

taught as well, and perhaps better, outdoors. For example, many schools are experimenting with planting trees, gardens or nature areas. The act of planting and caring for a tree, observing its growth cycles throughout the year, and discussing its niche within the surrounding built or natural ecosystem, is a "learn by doing" activity that can be conducted in most schoolyards. Compare this with the more traditional practice of pouring through chapters of a text or the more recent practice of sitting before a computer or video monitor. Of course, indoor and outdoor classrooms can, and should, work to compliment each other. Abstract and theoretical notions can often be applied, or put to practical use, in the context of outdoor hands-on class projects. Schoolyard learning activities also lend themselves to a multi-disciplinary approach. A school garden can be an instructional tool for teaching math (measuring & counting), science (environment), literacy (journal writing), social studies (urban agriculture) and art (scarecrows). Many schoolyard projects also lend themselves to community service learning by interacting with the surrounding neighborhood.

As with the school building, the use of the schoolyard is dependent upon the condition of the facility and upon the site's programmatic content. Traditionally, schoolyards have been seen as recreational open spaces that may contain ball fields and courts or play structures. At worst, they may have become unsafe vacant lots or parking annexes. Over the past several years, we have seen an emerging effort to tie school grounds to the core mission of the school – teaching & learning. The concept of the outdoor classroom has captured the imagination of local education advocates and practitioners have been actively engaging students in a variety of hands-on, experiential learning activities. From mapping and measuring to gardening and meteorology, to drama productions and student-drawn murals, we are witnessing a pedagogical surge that combines the best aspects of creative play and academic learning. The schoolyard of the 21st century is a multi-use site that fosters recreational, academic, and social activities and strives to weave its functionality into the fabric of school and community culture.

2. The Boston Schoolyard Initiative

The City of Boston, Massachusetts, has a long history of attention to its urban open spaces. Neighborhoods are often enlivened by the presence of community gardens, urban wilds, parks and playgrounds. Public schoolyards represent 250 acres, or approximately 10%, of Boston's open space. And yet, over the years, our school grounds had become a patchwork of crumbling asphalt, torn fences, and compacted soil. In the late 1980s, ad hoc groups of parents, teachers, students, and community activists began adopting individual schoolyards and sought to re-vitalize these neglected wastelands. Hampered by a lack of capital funding, and often taking years to complete, these groups tenaciously carved out areas that became the pride of school and neighborhood alike. Green spaces, play structures, and colorful murals began to re-energize the development and use of local schoolyards.

In 1994, the Boston GreenSpace Alliance, and a group of private sector philanthropies, approached Mayor Thomas M. Menino to suggest a public/private partnership aimed at re-vitalizing public schoolyards. The Mayor enthusiastically convened a Schoolyard Task Force to explore how such an Initiative might be structured. After six months of deliberation, having heard from scores of educators, parents & students, policy makers and design professionals, the Task Force issued its unanimous recommendations to the Mayor and the Boston Schoolyard Initiative

was born. The Schoolyard Task Force Report endorsed the following principles and guidelines:

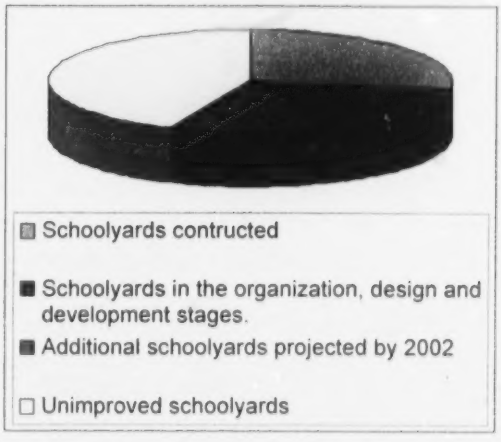
- ***Partnership Approach.*** The Task Force saw a community partnership model as key to the effort to revitalize schoolyards, one in which plans for each schoolyard are developed from a shared vision of the school and the community. The model should be designed to harness local initiative and truly stimulate local ownership. Selection of schoolyard projects should be based upon a competitive process that is fair and equitable, and which recognizes different levels of readiness among participating schools and communities.

- ***Outdoor Education Model.*** The task force envisioned incorporation of educational opportunities within the Boston Schoolyard Initiative to encourage and support, at every stage, utilization of the schoolyard as a vehicle for learning. Educational programming should target public school students, as well as neighborhood youth and community residents. The group urged inclusion of multi-disciplinary academic approaches, creative play, and community service learning opportunities; educational collaborations; and professional development for educators. It stipulated that planned or active educational uses of each schoolyard should be considered when granting funds to schoolyard groups.

- ***Maintenance Strategy.*** Task Force members agreed that the City of Boston should perform baseline maintenance for all schoolyards, while partners of the school and community should assume responsibility for maintaining schoolyard enhancements. This shared responsibility should take the form of a maintenance agreement established for each schoolyard project. The agreement should clearly identify roles and responsibilities so all partners can assume a measure of responsibility for the upkeep of each schoolyard.

- ***Funding the Initiative.*** The Task Force called for the Boston Schoolyard Initiative – to be funded through a combination of public and private funds -- to award grants to organize strong schoolyard constituencies to design and construct schoolyard improvements; to implement innovative educational programs; and to address ongoing maintenance and operational concerns. The Initiative partners should maintain close ties with the Boston School Department to ensure that all of Boston's public schools will have the opportunity to renovate their schoolyards over time.

After five years of implementation, the Boston Schoolyard Initiative is working with 56 public schools (out of 128) and has added valuable and productive open space to each of Boston's many neighborhoods. Thirty-five schoolyards have been constructed and twenty-one are engaged in their community organizing or design/development phases. By the year 2002, seventy-two schools and their neighborhoods will be actively involved in the Initiative.


Schoolyards contructed
Schoolyards in the organization, design and development stages.
Additional schoolyards projected by 2002
Unimproved schoolyards

A SCHOOLYARD ARBORETUM

The Boston Schoolyard Initiative (BSI) has worked with the Nathan Hale Elementary School (Roxbury) and the Arnold Arboretum of Harvard University to plan, install, and sustain an arboretum on school grounds. This pilot project, underwritten by a grant from the Urban Resource Partnership (URP), has engaged students, faculty, parents, and neighborhood residents in creating a teaching & learning resource that is perennial and sustainable. From site inventory to plant selection through community planting days, participants worked with landscape architects and Arnold Arboretum staff to design a schoolyard space that is truly an outdoor classroom. Linked to the Arboretum's Seasonal Investigations Curriculum, which links a web-based educational site with activities on school grounds, students studied a variety of trees, voted on the inclusion of their favorites, and presented a curatorial plan to the School Site Council. Faculty members have enhanced their teaching skills through professional development opportunities offered by Arnold Arboretum and students have gained an awareness of the natural world amidst their predominantly built environment. Grants are currently being submitted to expand the program to

A WETLAND MICRO-CLIMATE

The Massachusetts Audubon Society has partnered with the Haley Elementary School (Roslindale) to install a wetland on their school grounds. After the concept of a pond was rejected, because of safety and liability concerns, the local schoolyard group focused on a wetland micro-climate that will be an ongoing learning laboratory for students. The Massachusetts Audubon Society manages 22 acres of wetlands as part of the neighboring Boston Nature Center and will serve as a community-based partner as the Haley's wetland evolves. A group of Haley teachers recently received an Outdoor Classroom Grant, from the Boston Schoolyard Funders Collaborative to devise lesson plans tailored to their new site.

SOLAR CAR RACES

John Rowse, a teacher at the Dever Elementary School (Dorchester), is working with his students to construct and race solar-powered model cars in their schoolyard. Students will be competing in the Solar Sprint Races sponsored by the Massachusetts Institute of Technology.

3. ANALYTICAL IMPACT MODEL

The Boston Schoolyard Initiative and Education Development Center jointly developed this research project to consolidate existing research information on the impact of school grounds on learning and to assess the utility of existing research and knowledge for informing policy decisions.

3.1 Methodology of Research

The Boston Schoolyard Initiative and Education Development Center jointly developed this paper to consolidate existing research information on the impact of schoolyards and to consider the validity of these spaces as contexts which facilitate: (a) academic learning, (b) cognitive development, (c) environmental stewardship and (d) safety.

The primary means of identifying data on the educational value of schoolyards, and the measures

used to evaluate the impact of these programs included a literature review of scientific research using the ERIC database, and a survey. Prior to the research, an initial framework was developed defining common characteristics of high-quality schoolyards, and outlining the valuable ways that schoolyards can benefit students and other stakeholders. Six characteristics were identified based largely on the experience of the Boston Schoolyard Initiative at the local level, as well as the researchers' familiarity with programs nationwide and the educational expertise of the Education Development Center. A high-quality schoolyard (1) is multi-use and multi-task, (2) begins with an inclusive design process, (3) fosters partnership with community organizations, (4) is integrated into the educational planning process, (5) fosters continuity of use and (6) demonstrates sustainability.

3.2 Characteristics of a High Quality Schoolyard

A high-quality schoolyard is ***multi-use and multi-task.***

> The schoolyard is suitable for innovative learning and creative-play activities as well as traditional recreation. The site is also open to community and out-of school programs allowing for highest use and offering benefits to the greatest number of people possible. The site design and procedures are flexible and adaptable to changing and evolving usage.

A high-quality schoolyard begins with an ***inclusive design process****.*

> A high-quality schoolyard facilitates and encourages developmentally appropriate play and learning activities through its design, which means that experts on principles of cognitive development and age-appropriate play work with architects in the design phase. Furthermore, the design phase also emphasizes community participation, allowing the broadest possible range of potential users to give input. Through this process, the design responds to local needs and creates a sense of local ownership of the schoolyard.

A high-quality schoolyard fosters partnership with community organizations.

> Strong reciprocal relationships between schools and other community organizations form around high-quality schoolyards. By sharing the site, schools provide a valuable resource to community organizations and at the same time, schools benefit from the resources and expertise of partner organizations. A participatory planning stage can initiate the development of these partnerships even before the physical site exists, which enhances the utility and long-term sustainability of the schoolyard.

A high-quality schoolyard is integrated into the educational planning process.

> High-quality schoolyards are an integrated part of the school's learning curriculum, and serve as the site for teaching of traditional disciplines as well as interdisciplinary activities. The school [policy] environment enables the integration of indoor and outdoor activities by allowing teachers the flexibility of scheduling, planning and assessment they need to take an innovative approach to teaching in the schoolyard.

High-quality schoolyards foster ***continuity of use.***

By encouraging broad participation in the planning and design process, by fostering high levels of use by a range of community organizations and by integrating schoolyard learning activities into the curriculum, high-quality schoolyards create a "culture of use" that ensures the continuity of activities and benefits from year to year.

High-quality schoolyards demonstrate ***sustainability.***

High-quality schoolyards engage in environmentally friendly practices to ensure the longevity of the built and the natural environment. Maintenance of the physical site is considered from the beginning, starting in the planning and design stage, and is treated as an ongoing process – not a one-time investment.

According to the research framework, school grounds that exhibit these characteristics should promote a variety of positive outcomes. The broad underlying research question, "What is the impact of schoolyard learning programs?" was broken down into multiple hypotheses *(see below)* that address the following topics: (a) academic learning, (b) cognitive development, (c) environmental stewardship [and community volunteerism] (d) child safety .

3.3 Matrix of Research Hypotheses and Sources Reviewed

Impact Hypothesis	*Literature Review*	*EDC/BSI School Grounds Survey*
Academic Learning: Well-designed schoolyards are learning environments that contribute to improved academic learning, by providing a hands-on environment where children can gain learning skills and apply new knowledge and information, as evidenced by improved performance on standardized achievement tests, such as MCAS and improved mastery of curriculum standards.	Literature hypothesizes the link between school grounds and academic learning.	Over two thirds of survey respondents feel their school grounds learning programs improve academic learning.
Cognitive Development: Well-designed schoolyards not only contribute to the physical development, but also to the psycho-social development of young children, by providing spaces where children can practice new developmentally appropriate behavior and apply it to new situations, as evidenced by: performance and mastery of developmentally appropriate skills.	Literature substantiates the link between play and cognitive development, however, play is not limited to school grounds. Literature hypothesizes the link between school grounds and cognitive development.	Over ninety percent of survey respondents feel their school grounds learning programs support cognitive development.
Environmental Stewardship: Well-designed schoolyards help conserve the environment and foster greater environmental awareness and stewardship. Well-designed schoolyards create a learning environment that stimulates improved teaching and learning.	Literature states that traditional (classroom) teaching methods are insufficient to teach environmentally responsible behavior. Most authors hypothesize that ongoing exposure to natural areas, as well as outdoor experiences that create positive attitudes support children's environmental knowledge and promotes stewardship, however more research is needed to show impact, especially over the long term.	Over eighty percent of respondents feel their school grounds learning programs increase environmental stewardship. Over two-thirds of survey respondents feel their school grounds learning programs support service learning.
Safety: Well-designed schoolyards reduce the likelihood of injuries and are the site of fewer incidents of crime and vandalism. When crime and vandalism decrease on and near schoolyards, the value of the surrounding property increases.	Literature on playground safety is not specific to school grounds. Standards for equipment and play spaces are proposed, but not currently mandated by law. There are virtually no data on the effects of improving playgrounds, however there are extensive data on injuries occurring on playgrounds that do not meet the proposed standards.	Over three-fourths of survey respondents feel their school grounds learning programs reduce injuries and over fifty percent of respondents feel their school grounds learning programs reduce crime (on site).

4. What the Literature Tells Us

A review of the existing literature on school-grounds use was the first step in assessing the impact model. Scholarly books and journal articles were reviewed as well as practical guides and descriptive materials on specific programs. For the most part, these materials supported the impact model; however, due to the nature of the research, the current literature is often unable to rigorously substantiate the impact of improvement or creative use of school grounds. What we learned from this literature review caused us to revise several hypotheses within the impact model proposed for our study.

4.1 Methodology of the Literature Review

Three investigators searched the Educational Resources Information Center (ERIC) database to identify documents relevant to the framework. Thematic clusters of search terms were generated using the ERIC Thesaurus. This was especially important because the term "schoolyard" is not an ERIC keyword. The search included terms relevant to the hypotheses of our model. Multiplying the search terms revealed an extensive body of information in the form of journal articles, research and conference reports, and books. The literature available through ERIC also referenced much material not available through the database, some of which was obtained through local university libraries. Overall, the majority of information identified either consisted of "how to" guides or relied on observation, anecdotal evidence or professional experience (e.g., descriptive case studies). Unfortunately, this type of research is not necessarily generalizable. Furthermore, the lack of control groups makes it difficult to esablish a statistical connection between positive learning outcomes and schoolyards. We reviewed several literature reviews that found the same lack of scientific data concerning schoolyards (Titman, 1994; Tanner, 1999; Lieberman and Hoody, 1998; Hoody, 1995.)

4.2 The Built Environment and Learning Outcomes

A wide body of literature spanning several decades substantiates, with quantitative data, a positive relationship between the conditions of the built environment of the school and both student achievement and behavior (Earthman, *et al.*, 1995). It has been repeatedly documented that students' learning outcomes (often measured by standardized tests) improve when the physical conditions of their classrooms and school buildings are improved (Burkhead, et al, 1967; Michelson, 1970; Guthrie, 1971; McGuffey and Brown, 1978; Plumley, 1978; Chan, 1978; Edwards, 1992; Earthman and Lemasters, 1998; McGuffey, 1982; Weinstein, 1979). McGuffey (82) concludes from his review of 232 articles that improved facilities enhance the learning process, although the particular impact on the learner varies with the grade level and subject area.

In general, the studies cited above refer to the traditional classroom and internal school facilities as the key features of the built environment. However, one can extrapolate that if the conditions of the indoor learning environment have such a clear and consistent impact on learning outcomes, then the condition of the outdoor learning environment must also have a similar impact on these outcomes, and the conclusions about the built environment can be considered in relation to the schoolyard.

4.3 School Grounds Form an Important and Under-utilized Part of the Built Environment
Although much of the literature looks at the internal classroom as the built environment, school grounds, (here "school grounds" is used to mean outdoor areas within the school environment,) are very much a part of the built environment. However, the impacts of school grounds on the students who use them are not generalizable. There are many ways that school grounds can be developed, and the design will influence the type of play that takes place therein (Brett, et al, 1993).

Joe Frost of the University of Texas at Austin has developed a typology describing four dominant types of contemporary Western playgrounds. These categories include *traditional*, *designer*, *adventure* and *creative* playgrounds. The table below outlines the design characteristics and likely impact of each.

Table 1: Frost's School Ground Design Typology

Type	Characteristics	Common Perception	Impact/Benefits	Drawbacks
Traditional	• Formal, steel equipment set in concrete, include: jungle gyms, steel swings, slides, etc. • Dominate American schools	• Safe • Attractive • Fit in better	• Emphasize gross motor skills • Easy to maintain • Aesthetically more pleasing to many people.	• Limited imaginative or creative possibilities available to children. • Mistakenly perceived as safer, poor safety record. • One dimensional, lacking in natural landscapes, only allow one type of play, consequently ignores many of the critical developmental needs of children.
Designer (origin: the US in the 60's and 70's.)	• Designed by professional designers, • include equipment with a wide range of functions, • emphasize aesthetics.		• Emphasize aesthetics • Open and flexible to permit a wider range of activities and experiences than the traditional playground. • When well designed are safer than traditional playgrounds	• No formal process for including community's or children's input
Adventure (origin: Copenhagen during the 40's, remain popular in Europe, have spread to UK, only a few in the US)	• Informal fenced in areas with storage areas, and a wide range of materials available for use in imaginative and constructive play. • Children work with trained play leaders, with some supervision are free to do as they please. • Development must include community participation.	• Dangerous • Visually unappealing	• Encourage creativity, imaginative and constructive play • Conducive for cooking, gardening and animal care. • Significantly safer than traditional playgrounds • If well designed can complement any setting.	• Require presence of trained staff (cost), and access to and support for appropriate training. • Challenging to implement.

Type	Characteristics	Common Perception	Impact/Benefits	Drawbacks
Creative (a combination of traditional, designer, and to some extent adventure playgrounds.)	• Semiformal, • Constructed from existing commercial equipment and scavenged equipment (recycled and found materials.) • Usually a community initiative, and created through community participation process.		• encourage all types of play • provide children with maximum play possibilities at low cost. • safe and attractive when well designed.	

Most American playgrounds fall under the category of the traditional playground (ball courts, swing sets, jungle gyms etc); they are frequently geared toward exercise, or functional play and most space is devoted to sports fields and spaces for organized play (Frost, Klein, 1979). Adults make the decision about what design fits well in the surrounding environment with little input from the children who use it. An important consideration for adults in selecting the design may be ease of maintenance (Moore, 1997). The safety risks associated with traditional playgrounds, as noted in the table above, are high. This type of design also imposes limitations on the type of play that is encouraged by the school grounds. These traditional playgrounds generally promote rule-bound play, the preponderance of which can inhibit the creative and imaginary play of children, which is developmentally important for children (Frost, Klein, 1979).

Of the four playground types described, the adventure playground is least well known in the US, although it is very popular in the Nordic countries and has been introduced with some success in the UK. Adventure playgrounds require trained pedagogical personnel to maintain them; this requirement appears to inhibit their success outside of the Nordic countries where pedagogical personnel are held in the same esteem as educators from the formal sector. (Brett, et al, 1993).

The typology demonstrates that different school ground designs promote different impacts. If community members desire a certain impact they can and should tailor their school grounds' design to meet their needs. In general the literature discusses school grounds in terms of four desired impacts: Academic Learning, Cognitive Development and Socialization, Environmental Stewardship, and Safety.

4.4 School Grounds Have a Positive Impact on Academic Learning

Although a substantial body of research literature thoroughly supports a positive relationship between the condition of the built environment and students learning outcomes, there is a lack of literature specifically linking school grounds to students' learning outcomes. In general, the educators who responded to our survey are already convinced of the value and benefits of using the school grounds as a learning environment, based on their own experience. But not everyone shares this conviction. Changes in learning outcomes resulting from school ground learning can be assessed quantitatively by measuring changes in standardized test scores, grade point averages and learning skills as indicators of impact. Several recent studies that measure learning outcomes this way demonstrate a positive relationship between learning that takes place outside of the classroom and improved learning outcomes in traditional skill areas. (Leiberman and Hoody, 1998; Leiberman and Hoody, 2000)

Seer Study
Researchers with the State Education and Environmental Roundtable (SEER) have been studying the relationship between the learning environment that exists outside of the classroom and its impact on student learning. Specifically SEER has implemented a methodology that uses the school surroundings and community as the environment within which students can construct their own learning, guided by teachers using proven educational practices. This methodology is called *Using the Environment as an Integrated Context for Learning*, or EIC (Lieberman and Hoody, 1998). The SEER study looked at 40 schools across the US that exemplify the EIC approach. A comparative analysis of academic achievement was conducted on fourteen of the schools. The results indicate that 92% of the students who have had the opportunity to learn through the EIC process outperform their peers in traditional programs (Lieberman and Hoody, 1998).

The observed benefits of EIC-based programs include the following:

- Better performance on standardized measures of academic achievement in reading, writing, math science and social studies;
- Reduced discipline and classroom management problems
- Increased engagement and enthusiasm for learning; and
- Greater pride and ownership of accomplishments.

In defining EIC, the SEER study includes school grounds, but does not specify the extent to which the impacts of EIC are attributable to activities that take place solely on school grounds. Each of the forty schools included in the study uses a different combination of locales, which often begin with in-house facilities and then branch out into:

- Developed areas of school grounds, including playgrounds;
- Undeveloped school property, such as fields or woodlands;
- Off-site study areas, both natural habitats and community settings; or,
- Multiple study sites located throughout a geographic region.

Thus, although the SEER study reflects a positive outcome in academic learning, it does not isolate benefits derived from school grounds from those derived from other locations outside of the classroom.

4.4.1 Designing School Grounds to Improve Academic Achievement

Design Features of EIC Programs
Successful EIC programs share the following characteristics:

- Interdisciplinary integration of subject matter;
- Collaborative instruction;
- Emphasis on problem solving and projects;
- Combinations of independent and collaborative learning;
- Learner-centered and constructivist approaches.

The University of Michigan (School of Natural Resources, 1998) recently conducted another study with relevance to school grounds. The study surveyed over 500 educators, and revealed that many educators perceive a host of positive benefits stemming from the integration of the schoolyard into the students' learning experience. Although in this study the goals of school grounds are vague, the design elements are more concrete and are reminiscent of those found in successful EIC schools. Teachers attribute schoolyard success to:

- The value of hands-on experience;
- The pride and sense of ownership in projects;
- The opportunity to learn using more of the senses;
- The range of subjects that can be addressed by outside activities.

Another qualitative example substantiating the value of improved schoolyards as an educational resource is found in a review of 13 case studies of English school ground sites, conducted by Kirsty Young (1990), published by the Learning Through Landscapes Trust. Young examines a variety of school grounds that provide an opportunity for learning and play. These creative and inspirational examples also demonstrate how to integrate the school grounds into the curriculum in innovative ways. The success of the programs is asserted in the tributes of the teachers.

> "My observations of the success of such learning situations and children's reactions to them were initially based on the awareness that motivation increased, that children's work was always of a higher standard after such experience and that there was a change of relationship between staff and pupils which resulted in changed attitudes by the children to school and its tasks...learning takes place when observation is sustained and the nature of the task is suited to
>
> **-Head teacher of the Crawly middle school, Surrey**

Young does not indicate precisely how success is measured beyond teachers' testimony, or what characteristics or design features are common to the successful programs. Although rich in conviction, the Young and University of Michigan studies, like so many others, lack the concrete, qualitative evidence of the SEER study.

Design Scale

An interesting new development that will demonstrate the effects of school grounds on academic learning is a design assessment scale for elementary schools (DASE) being developed by Professor C. Kenneth Tanner of the University of Georgia's School Design and Planning Laboratory. The purpose of the tool is to help ensure that the design of new facilities will be developmentally appropriate learning environments. The tool will also assess and quantify how different learning environments (both in-door and outdoor) affect cognitive development and student learning.

DASE measures functionality, safety, adequacy, quality, the degree to which a design pattern is present, and the overall impression of the learning environment with a 10-point likert scale. Although DASE is still being refined, preliminary results indicate a positive relationship between students learning and their environment, specifically school grounds. Once DASE is refined it may yield both a useful design tool and a valuable assessment tool for effective development and evaluation of schoolyard learning environments.

4.4.2 Critique of the Literature

The SEER study is somewhat of an exception: the bulk of the literature about learning that takes place in the schoolyard does not quantify benefits in terms of learning outcomes. Rather most of the literature is qualitative and focuses on the enrichment of student attitudes, behaviors, and learning skills (Titman 1994; Young 1990; University of Michigan School of Natural Resources, 1998). These benefits are often conveyed through teacher observation and anecdotal evidence, which overwhelmingly attribute positive – if unmeasured – benefits to learning that occurs in the schoolyard.

4.5 School Grounds Have a Positive Impact on Cognitive and Social Development

> *...Playgrounds should stimulate play, for the values of play are widely documented by researchers and acknowledged by professionals who work with young children. Play is fun, active, spontaneous, self initiated, and challenging, and it is closely linked with learning and development. The playground is merely a stage where children act out, spontaneously and freely, the events that touch their lives and simultaneously develop durable, resilient bodies through movement. In contrast to bad playgrounds, good playgrounds increase the intensity of play and the range of play behaviors...Bad playgrounds limit play behavior, restrict language, reduce physical movement, and create behavioral problems.*
>
> *Playgrounds should promote learning and development. Play enhances both convergent and divergent problem solving and it allows better performance on tasks requiring divergent creative thought. Dramatic or symbolic play contributes to a range of developmental virtues including communication, sex-role development, cooperation, perspective-taking ability, creativity and social and interpersonal problem-solving skills....*
>
> *-Joe L. Frost*

The history of the psychological theories of play and its critical role in the social and cognitive development of children is well documented in the literature, notably in the writing of Jean Piaget (Frost, Klein, 1979; Fernie 1988). "Play enhances cognitive, affective and psychomotor development...(and) helps a child become a fully functioning person by integrating all aspects of development" (Brett, et al, 1993). "Through play children learn what they cannot be taught" (Titman, 94). Joe Frost, states that playgrounds should promote a range of play behaviors due to the important role of play in a child's learning and development.

> ***What is play?***
>
> *Play represents what one enjoys while one is doing it, while work is what one enjoys once one has accomplished it.*
> *-John Dewey*
>
> *Play is the principle business of childhood.*
> *-Jerome Bruner*
>
> *...Behavior that is intrinsically motivated, freely chosen, process-oriented and pleasurable.*
> *-J. Ershler and J. Johnson:*
>
> *Play is children's primary motivation to engage with each other and their surroundings.*
>
> (Quotes from Brett, et al, 1993, p.61)

The type of play and its purpose changes as a child's development progresses. Initially play is a sensory motor experience for a child. Around age two play acquires a symbolic nature, and after age 6 or 7, play becomes about games with rules (Brett, et al, 1993). The common thread is that through play children learn about themselves, their

environment, how to interact with their peers and with adults (Fernie, 98). Through play, children learn how to get along in the schoolyard.

To a small extent the Frost typology *(see section 4.2)* addresses the ways that different playground designs promote different types of play. It indicates that traditional playgrounds promote gross motor skills, that designer playgrounds permit a wider range of experiences and activities than traditional playgrounds, that adventure playgrounds encourage creative, imaginative and constructive play, and that creative playgrounds encourage all types of play. However, the literature on school grounds and the resulting cognitive and developmental impacts is limited and would benefit from further study. In the Complete Playgrounds Book (1993), Brett, Moore and Provenzo state, "We believe that the greatest need for research is to advance understanding of the role that playgrounds can play in the developmental processes of children...Carefully controlled studies are needed to document the benefits that are derived from particular types of settings or programs."

What do the Children Have to Say?

In what is considered a seminal work, Wendy Titman (1994) with the UK based Learning through Landscapes Trust, conducted a qualitative research study using semiotics, to assess how children's attitudes and behaviors are influenced by school ground design. Titman finds a positive relationship between the design of school grounds and the way they are managed, and children's attitudes and behavior. She concludes that children are very much aware of and influenced by the conditions of their schoolyards.

Titman asserts that school grounds, like any external environment, give children unspoken messages and meanings. These messages influence their attitudes and behavior, not just in relation to the grounds and the time that they are using the grounds, but in relation to the school as a whole. The state of the schoolyard gives students a message about the schoolyard, the extent to which it is cared for, enjoyed, and used, as well as a message about fellow students and who they perceive themselves to be. These messages constitute the "Hidden Curriculum" of the schoolyard, and the hidden curriculum influences students attitudes and behaviors. Titman concludes that it is within the power of those who manage schools to determine the messages that the Hidden Curriculum sends to their students.

The outcome of the Titman study is a positive correlation between the conditions of school grounds and the behavior and attitudes of children, as measured qualitatively. The design elements necessary to achieve a positive relationship between the school grounds and the students attitudes and behavior require considering the children's opinions in the design and management of the grounds. Guiding principles are:

- School grounds matter to children
- Children consider school grounds an extension of the school
- School grounds belong to the school and those who manage the school are responsible for the grounds
- Children look to the school grounds for activities including doing, thinking, a place for feeling (beauty and color) and a place for being themselves.

> ***Physical settings communicate symbolic messages about the intentions and values of the adults who control the setting.***
>
> ***-Proshansky and Wolfe.***

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- School grounds reflect the ethos of the school.

Others look toward the yet untapped educational potential of school grounds. Mary Rivkin suggests that because play provides an incentive for children to learn, the playground and the context of play provides an ideal opportunity to teach children about peace and the skills of conflict resolution. "Among the skills that children need to develop are observing one another and responding appropriately, being flexible and willing to accept others ideas, offering ideas for play that appeal to other children and taking turns. To a large extend these skills are learned through play itself," simply because continuation of play provides an incentive for learning these negotiation skills. (Rivkin, 1995: 61)

The Right to Play

Rivkin views peace as an essential human need, and play as an essential right of all children that has been gradually taken from them as society has evolved into a faster-paced, more densely inhabited and frequently unsafe environment. Children are losing their traditional play environment, which has traditionally been outdoors and in nature. The play environment, according to Rivkin, has been compromised due to population pressures, pollution, and the dangers of congestion. These changes have increased the need for supervised play, but at the same time it has become increasingly common for both parents to work. In an effort to keep children safe, their play areas and opportunities are restricted. Within the school playtime is being reduced in response to curriculum requirements. Yet nature, argues Rivkin, belongs to all of us, including children. And children have a right to have access to nature. Rivkin references the work of the evolutionary theorist E.O. Wilson when she states that we have evolved with a link to nature, and we continue to need this link. (Rivkin, 1995)

The right of the child to play is also advocated by the Danish NGO, the International Association for the Child's Right to Play (IPA), and the United Nations Convention on the Rights of the Child (Article 31). Both assert that children have a right to play outside. Article 31 states that the child has a right to leisure, play, and participation in cultural and artistic activities. IPA advocates for this right and attempts to protect, preserve, and promote children's play as a means to ensure maximum development of the individual.

4.6 School Grounds Have a Positive Impact on Environmental Stewardship

4.6.1 Environmental Literacy means Environmental Action

In recent years, the topic of environmental education has received increased attention; however indicators such as the National Environmental Report Card suggest that attempts to education the public about the environment have had only limited effect on Americans' environmental knowledge, attitudes and behavior. Without adequate skills and motivation, citizens are unprepared to participate in public dialogue to address complex environmental issues (NEETF/Roper 1997, as discussed in Ohio EE 2000, 1999). Simply being "informed" on environmental topics is not enough. In order to prepare citizens, who can truly contribute to the resolution of complex, fundamental problems in their communities, environmental education programs must meet a higher standard: environmental literacy has come to mean not only knowledge of, but also the ability and willingness to analyze and act on environmental issues (See, for example, Roth and Hungerford and Tomera, cited in Hoody, 1995:4; Hungerford and Volk, 1990).

4.6.2 Designing School Grounds for Maximum Environmental Impact

Clearly, the act of planting a garden or restoring native habitats improves the natural environment of a school site, but the benefits of such projects are multiplied countless times when restored sites are used to teach skills, reinforce attitudes, and model behavior in students to instill an enduring commitment to environmental responsibility.

Research shows that projects that restore and nurture school grounds effectively promote knowledge and support of the environment among schoolchildren—provided that key design factors are in place. Margarette Harvey's study of almost 850 elementary students from 21 schools in the south of England revealed higher general as well as specific (i.e. knowledge of plants at the school site) botanical knowledge among students from school grounds characterized by more vegetation and more complex landscape features (Harvey, 1989). When compared to their peers from schools with undeveloped school grounds, students who had been exposed to more vegetation and landscape features showed higher scores for pastoralism ("the enjoyment of the natural environment in an intellectual and aesthetic fashion") and lower scores for human dominance ("the belief in [humans'] right to use technology to adapt to and dominate nature") (Harvey 1989:11, 13).

Research by Sonja Skelly and Jayne Zajicek on the effects of elementary school gardening programs in Texas corroborates these findings. Like Harvey, Skelly and Zajicek used the pastoralism and human dominance (the latter also called "environmental adaptation") indicators from the Children's Environmental Response Inventory (CERI) developed by Bunting and Cousins (1983). Skelly and Zajicek found that children whi participated in a school gardening program showed more positive environmental attitudes than peers who did not participate. Most participating students surveyed also reported learning about plants at school (as opposed to learning from books, at home or while playing). Although the location of the learning did not significantly affect environmental attitude scores, this result is important because it suggests that school is a main source of environmental information for these students.

Although simply coming in contact with the natural world is a prerequisite for environmental learning, particularly in urban areas, it is only a beginning. The quality of student interactions with nature dramatically affect whether students will make protecting the environment part of their values and act on those values for the rest of their lives. Teaching methods that merely impart knowledge are inadequate when it comes to changing behavior. Traditional views of environmental education held that changing knowledge would change attitudes, which in turn would change behaviors. However, research onto environmental behavior shows that this linear relationship is not valid (Hungerford and Volk, 1990). Although knowledge and skills are necessary for environmentally aware action, they are not sufficient.

Hands-on, inquiry based teaching is essential to model environmental stewardship and provide the reinforcement that will bridge the gap between environmental knowledge and action. Nevertheless, as recently as 1987 a study of American science teachers showed that 16% never used the outdoors for educational purposes (Keown, 1987 as discussed in Harvey). Research suggests that students may even be confused when there is an apparent contradiction between the attitudes and ideals of caring for the environment taught in the classroom and the "hidden curriculum" of a school's degraded outdoor environment (Titman, 1994: 87). Neatly manicured

landscaping, although it offers an improvement over asphalt, may suggest a "hands-off orientation….discouraging children from being participants and stewards in their own environment" (Takahashi, 1999: 11).

Furthermore, knowledge must be reinforced over time. A single class is seldom sufficient to develop, let alone maintain environmental literacy. In a University of Michigan survey, elementary school teachers cited lack of natural areas at the school site as a limiting factor in their ability to integrate outdoor spaces into the school curriculum. Other important attributes, such as "environmental sensitivity" come from "positive experiences in non-formal outdoor settings over long periods of time" (Hungerford and Volk, 1990: 14). These sorts of experiences are not present in the traditional classroom. For children in urban settings in particular, a well-designed schoolyard may provide a child's most formative experiences with the natural environment. Thus effective environmental education implies a shift, not just in classroom time devoted to the topic of environmental issues, but also a fundamental rethinking of teaching methods to include the outdoors.

4.6.3 Critique of the Literature

The relationship between integrated learning activities in the school grounds and children's environmental attitudes is well substantiated by a few pieces of research. Several researchers (e.g. Harvey, Skelly and Zajicek) have drawn on the CERI indicators (Bunting and Cousins, 1983) to develop consistent schemes for rating student attitudes. Studies in environmental education also tend to offer control groups to establish comparative results. However, what is notably lacking from the literature on the impact of environmental education is an assessment of the impact on behavior, in particular, environmentally responsible behavior later in life.

After reviewing 150 research articles and conducting 500 phone interviews to evaluate the effectiveness of environmental education, Hoody (1994) concludes that these sources of information and student performance are rarely evaluated. Hoody attributes this lack of assessment to the following reasons: the lack of funding for assessment, the difficulty of incorporating assessment strategies into traditional school structures, and the fact that most evaluations address knowledge and attitudes rather than behavioral changes. Therefore, although many Environmental Education authors express the idea that changing knowledge is not sufficient, few assessments look beyond knowledge criteria to measure ability to apply knowledge, ability to analyze courses of action and willingness to act on environmental issues.

4.7 School Grounds Have a Positive Impact on Safety and Physical Well-Being

4.7.1 Desired Impact and How We Measure It

Swing, slides and jungle gyms are symbols of carefree childhood recreation, and yet nationwide studies suggest that traditional playgrounds can pose grave hazards to our children. *Playing it Safe: A Fifth Nationwide Safety Survey of Public Playgrounds* (PIRG/CFA, 2000) points out that the CPSC, in 1998, estimated approximately 170,100 children playing on America's playgrounds suffer injuries requiring medical treatment in an emergency room with playgrounds claiming an average of 17 lives per year. Unfortunately, efforts to reduce the number of playground injuries have not been successful. In 1974, the CPSC estimated 117,951 emergency room visits by children injured on playgrounds nationwide (Frost and Klein, 1979), a 44% increase. Although the increase in reported playground injuries might be due to improvements in sampling and reporting methods, it is telling in that the hazardous conditions that plagued playgrounds in the 1970s, when

CPSC began collection of statistics on playground injuries, still exist today. According to Dr. Donna Thompson, founder and director of the National Program for Playground Safety (NPPS), the annual health care costs for playground injuries reached $1.5 billion[1], not to mention the additional cost of lawsuits that are likely follow. The literature remains optimistic about the impact that well-designed schoolyards can have on children's physical safety.

The literature asserts that if schoolyards are safe, then schools will benefit from the reduction of minor injuries and elimination of serious injuries. School will significantly reduce the frequency of aggressive behavior; which reduce children's safety concerns and in turn creates an environment favoring growth-producing, satisfying play. Schools will nurture peacemaking skills and feelings and therefore create a peaceful playground; and finally, schools will create a place where children can explore and establish equitable relationships.

Although the literature is very forthcoming with the benefits of a safe schoolyard, it has done little to provide the indicators to measure these outcomes and impacts. This lack of credible and commonly held indicators among researchers, probably contributes to the lack of scientific data available on these outcomes and impacts.

A note must be made here: literature on issues of schoolyard safety specifically is not very common. Most reporting, such as the reporting done by CPSC, aggregates injuries in schoolyards with those in parks, recreational centers, and even homes that have play sets in the backyard. Currently there is no national system in place for the collection of comprehensive data on school injuries (Posner, 2000). Therefore, care must be taken when using more general playground safety information to design injury-free schoolyards. In spite of this caveat, the playground safety literature offers guidelines for design that have relevance to school sites and in particular to traditional play equipment on school grounds.

4.7.2 Design Features: How Do We Arrive at These Impacts?

In *Children's Play and Playgrounds* (1979), Joel L. Frost and Barry L Klein attributed the causes of playground injuries to the following three dangers:

1. *Hazards attributable to defects in construction and design.*
2. *Hazards resulting from improper installation and maintenance.*
3. *Hazards associated with function[2] (resulting from human error)*(pg.60)

More recently, the findings in the *Playing it Safe* and the NPPS report reveal that the same issues of design, maintenance, and function that Frost and Klein wrote about twenty years ago are still the cause of accidents.

1. Lack of adequate protective surfacing, particularly around fall zones
2. Lack of proper maintenance (e.g. worn paint, rust, and splinters)
3. Lack of supervision and/or signage indicating rules or the appropriate age level for the playground

[1] http://www.cnn.com/chat/transcripts/2000/4/28/thompson/index.html

[2] improper use of equipment

Several schoolyard design guides exist that address the issue of injuries due to play. For example, the *Handbook for Public Playground Safety* published by the Consumer Product Safety Commission (CPSC). The Consumer Federation of America has also produced the "Model Law on Public Play Equipment and Areas" which CFA considers to be the state of the art in safety and design for public playgrounds and hopes it will become policy at the federal, state and local level. Most of the sources on playground safety offer similar guidelines, such as a focus on maintenance, supervision, age appropriate design, and proper fall surfacing. Schoolyards should undergo routine inspections to identify any of the dangers documented by *Playing it Safe* and the NPPS reports. To the dismay of many of the people and entities working to make playgrounds safer, there are no federally mandated safety standards for school or public recreation areas or the outdoor play equipment therein (NPPS, January 2000).

Other dangers on the schoolyard arise, not from unsafe equipment, but due to conflict among children. According to the Bureau of Justice Statistics, 28 percent of students nationwide between the ages of 12 and 19 reported gangs on campus in 1995, an increase from 15 percent in 1989. In 1997, students between the ages of 12 and 18, were victims of more than 200,000 serious violent crimes[3]; in all about 2.7 million crimes were committed on America's schools. And although statistics do indicate young people are less likely to be victimized at school, the number of students who sometimes or most of the time fear an attack or harm at school increased to 9 percent in 1995, from 6 percent in 1989. Research has shown that the primary cause of bullying on playgrounds is lack of other things to do (Rivkin, 1995). This means that the obvious way to significantly reduce aggressive behavior is to provide sufficient play activities with differing levels of complexity that engage students on the schoolyards (Brett et al, 1993). Another avenue schools can follow to alleviate issues of violence in schoolyards is the use of conflict and mediations programs, where the schoolyard becomes the practice field for new knowledge gained through these types of programs. Rivkin suggests that teachers and staff set expectations, teachers should take time to debrief with their students' experiences on the schoolyard in the classroom, and that they should make it a point to challenge stereotypes. The desired outcome of conflict resolution programs that are intertwined with the schoolyard is the creation of a space where new, more equitable relations can be explored (Rivkin, 1995).

Efforts also have to be made to educate children on the dangers of the outdoors, particularly when outdoor play involves activities in natural settings. This involves proper use of equipment as well as awareness of dangerous plants and animals. With regard to proper use of equipment, this does not imply that children should be kept from experimenting with new uses, but they should be taught to be responsible and critical. Making children aware of hazardous situations is also important; for example: crowding on a slide increases the potential for a fall. Additionally, those supervising children's play should be taught about potential dangers and how to respond to those dangers, if they should arise. Not only do supervisors have to be trained, but there also has to be sufficient numbers; this of course depends on several factors, such as: the type of playground, the age and physical ability of children, and number of children.

The literature also expresses the need to include parents, teachers, and administrators to construct a common understanding of what constitutes safe yet challenging play. Community involvement leads to additional resources. Resources that can be used to engender local policy changes.

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[3] This is rape, sexual assault, aggravated assault, and robbery.

To reiterate some of the main design features of a safe schoolyard that insure children's well-being, schoolyards:

- are designed according to established safety guidelines;
- include a maintenance routine that involve inspections;
- inspire growth producing challenges;
- provide sufficient play activities that engage children;
- have children who are educated on outdoors hazards;
- involve conflict resolution and mediation programs;
- are built on the involvement of parents, teachers, and administrators that develop a common understanding of what is safe yet challenging play.

4.7.3 Critique of the Literature

Although playground safety literature, from sources such as the NPPS and PIRG/CFA, documents design flaws and risk factors that currently exist on playgrounds, there is insufficient information to draw a firm conclusion about the impact improved design would have on children's physical well-being. Furthermore, the literature's current emphasis on general playground and school safety, as opposed to school ground safety, makes it difficult to say conclusively what the most pressing issues of school ground safety are.

4.8 Designing for Impact: Best Practice in School Grounds Design

The literature shows that school grounds are used to support a variety of learning and child development outcomes. Although there is little quantifiable data on the true impact of school grounds, there is a wealth of information on design principles and processes based on successful projects and on the experience and expertise of practitioners. Several design elements, such as including natural (green) space, providing unstructured play space, and training teachers and playground supervisors are cited as factors in achieving broad educational and developmental benefits. Much of the literature consists of detailed design guides, which offer advice on specific gardening projects or lesson plans; however, these guides are less generalizable because they tend to offer advice for very specific contexts.

Most authors strongly recommend that schoolyard designers involve an array of stakeholders from the school and the broader community in the design process. Community input in design expands the vision of how a site can be used. In the design phase, schools may encourage community organizations to share the construction and maintenance costs, since they will receive the benefit of the improved school grounds. Collaboration with community groups at the design stage also opens the door to ongoing cooperation once the site is established. Community groups can initiate or support after-school programs, community service activities, and enrichment activities during the school day.

Adult supervision that supports and guides children's activity is a key factor in achieving many desired school ground benefits. Although experts agree that well-designed playgrounds give children unstructured space for creative play, the literature also emphasizes the importance of teachers who are trained to recognize and use the "teachable moments" that arise in the school grounds and to integrate outdoor learning into the indoor curriculum. Adult supervision is also an important way to promote safety and appropriate behavior.

Although there are generally accepted principles for good playground design, they are not without tradeoffs. At times it even seems that the guidelines to achieve different benefits are in conflict. For example, many of the elements that make school grounds exciting and challenging to students can also make the site less safe. In order to achieve maximum developmental benefit, children must work at the upper threshold of their capabilities. Ironically, some elements such as concrete ramps, which make equipment accessible to children who are physically challenged, are also hazards. Fortunately, adult supervision can help balance the desire to provide for physically challenging play space with the need for safety.

Another set of conflicting interests may be brought to light by community use of school sites. Once again, ensuring safety is a main concern of the school, specifically, by controlling the extent and conditions under which people from outside the school community are allowed on school grounds. Even in the design stage, conflicts may arise between site layouts that promote free flows of people and those that control and direct these flows. For example, gates and fences that keep children in certain areas may diminish children's self-guided learning and play. Also, schools may wish to restrict access to the site with gates and fences, which can make it difficult for outside groups to make use of the facilities. Involving community groups in a school grounds project from the very beginning may stir up more of theses issues, however it also creates a forum to discuss them early on, at a stage where participants can discuss these issues and resolve them in ways that balance everyone's needs.

Maintenance of the site is also an important design consideration. A poorly maintained site is unlikely to produce any of the desired outcomes; however an easy-to-maintain design probably does not include many of the complex features that stimulate learning and cognitive development. Maintaining a high quality schoolyard is not necessarily as easy as maintaining a plain lawn or bare asphalt, however simple steps such as developing a maintenance plan and involving students in the upkeep of the site go a long way toward minimizing any extra work. Besides, given the potential benefits, it would seem the extra effort is worthwhile.

5. What the Survey Tells Us

In addition to the review of literature, the researchers designed a survey instrument to test the research framework against the experiences of practitioners currently implementing or offering support to a wide variety of schoolyard learning programs.

5.1 Survey Methodology and Sample

The survey was designed to gain a perspective on the ways educators use schoolyards, to compare the characteristics of the framework with the experiences of educators, and to gather educators' impressions and any existing data on the impact of their programs. The survey was mailed to over 200 educators involved with schoolyard programs, in 4 countries. The mailing targeted schoolyard programs that have published information or have been written about, have an Internet presence, or have been associated with conferences or other activities related to schoolyards. A web interface was designed permitting survey recipients to respond on-line. Survey recipients were encouraged to disseminate the survey and the website address allowing the sample to "snowball".

One hundred and twelve respondents from the United States, Finland, Sweden and the United Kingdom returned surveys. Within the US respondents represented 31 states and the District of

Columbia. The highest numbers of responses come from Massachusetts (16) and California (11). The majority of respondents are teachers and principals who direct schoolyard programs at their own schools and members of community groups or government agencies that provide information and training to schoolyard programs. 37% of the schoolyard programs described are located in urban areas; 43% in suburban areas and 28% in rural areas. (Percentages do not add to 100% because respondents were allowed to choose more than one category.) On average, students spend roughly three hours a week in schoolyard activities, both during and outside of the school day. More than 90% of respondents report working with some type of group in the broader community.

5.2 Survey Data on Characteristics of Schoolyards

Respondents overwhelmingly agreed that their schoolyards now reflect the principles of good schoolyard design set forth by the survey. *(Please see appendices 3 and 4 for additional survey data on obstacles and benefits of schoolyard programs.)*

Table 2

1. Our schoolyard design/activities are multi-use, multi-task.	99% yes (n=103)
2. Our schoolyard was designed through a participatory process.	94% yes (n=100)
3. Our schoolyard learning activities foster partnership with community organizations.	88% yes (n=102)
4. Our schoolyard learning activities are integrated into the educational (curriculum) planning process.	90% yes (n=104)
5. We have mechanisms in place to ensure that ongoing use of the schoolyard for integrated learning activities.	82% yes (n=99)
6. We have maintenance mechanisms/processes in place to ensure the sustainability of the schoolyard.	85% yes (n=95)

Respondents were invited to comment further on the characteristics above and to describe their own schoolyards programs in greater detail. The key findings of their responses follow.

- Environmental education and science are the subjects most frequently taught using school grounds. Math, art, language arts, and reading are also common. History and civics education were mentioned less frequently.
- Survey respondents also report using schoolyards to teach agriculture, architectural design, business and finance, character building, cooperative games, cooperative learning activities, drafting, drama, ESL, life skills, geography, music, natural history, nutrition, personal development, physical education, problem solving, religious education, research, social skills, Spanish, technology, and writing, among others.
- About half a dozen respondents say they try to relate schoolyard learning to curriculum and standards
- Many programs use "inquiry-based," "hands-on" teaching methods in the schoolyard.
- Common features include restored/native habitat, birdfeeders/birdbaths and greenhouses

- Gardens are by far the most commonly reported feature. Among the many varieties of schoolyard gardens mentioned are:

ABC Garden,	Hummingbird Garden,	Soup Garden,
Berry Garden,	Multicultural Garden,	Three Sisters Garden,
Butterfly Garden,	Pizza Garden,	Urban Garden,
Carolina Fence Garden,	Pumpkin Patch,	Vegetable Garden,
China/Ghana Garden,	Rainbow Garden,	Water Garden,
Flower Garden,	Roots and Shoots Garden,	Wildflower Garden,
Guinea Pig Garden,	Square Foot Garden,	Wildlife Garden.
Herb Garden,	Senses Garden,	

- Several sites include composting and recycling projects to promote environmental stewardship.
- In two service learning programs, students grow vegetables for a local charity or food bank.

5.3 Survey Data on Research Hypotheses

Respondents also rated their level of agreement with hypotheses about the benefits of well-designed schoolyards. Respondents were asked to rate the statements using a 4-point likert scale, where 1 represented "almost always" and 4 represented "almost never." The information gathered from this portion of the survey corroborated the findings of the literature review and other similar survey data. However, respondents reported that their responses were based almost entirely on anecdotal and impressionistic evidence, from observation of their own programs, so these findings do not assuage the previously mentioned lack of rigorous, control-group data in the published literature.

Table 3

Survey Item	Percent of Respondents answering "Almost Always" or "Frequently"
1. Our schoolyard learning activities have a positive impact on academic learning (as measured by improved performance on standardized achievement tests, improved mastery of curriculum standards).	69% (n=88)
2. Our schoolyard learning activities contribute to the physical and psycho-social development of young children.	92% (n=94)
3. Our schoolyard learning activities allow children to experience community service.	70% (n=94)
4. Our schoolyard learning activities foster community participation in education, by enabling community members to participate in all aspects of schoolyard-related activities, including a participatory design phase.	60% (n=94)
5. Our schoolyard learning activities have a positive impact on the learning environment, which stimulates improved teaching and learning.	93% (n=92)

6. Our schoolyard learning activities foster greater environmental awareness among students.	94% (n=95)
7. Our schoolyard learning activities foster greater environmental stewardship among students.	81% (n=92)
8. Our schoolyard design reduces the likelihood of injuries.	75% (n=85)
9. Our schoolyard design reduces the incidence of crime (e.g. delinquency, vandalism, trespassing) on campus.	59% (n=74)
10. Our schoolyard learning activities promote cooperative and collaborative rather than negative, aggressive play.	89% (n=91)
11. Our schoolyard design fosters activities that are inclusive with regard to... gender...	99% (n=89)
economic status...	100% (n=88)
ethnicity...	98% (n=85)
physical ability.	92% (n=87)

5.6 Survey Results in the Context of other Recent Schoolyard Survey Research

The findings of the EDC/BSI survey are in line with trends identified by other recent surveys on the nature of schoolyard activities and their impact on learning. Most notably, the importance (and difficulty of) securing adequate funding emerges as a crucial factor influencing the success of a schoolyard program. In a survey conducted by the National Wildlife Foundation of certified Schoolyard Habitat Programs (*please see appendix 5 for a summary of survey characteristics*), money is listed as the biggest obstacle to developing a schoolyard habitat. As previously mentioned, funding was by far the most frequently mentioned obstacle in the EDC/BSI survey. Conversely, an extensive survey of school garden programs conducted by the University of Massachusetts Extension program concludes that "tangible resources, including financial" contribute to program success.

A survey conducted by PROJECT HOME of the New Hampshire Fish and Game Department finds lack of money to be a major "stumbling block" for schoolyard programs, second only to curriculum demands. Difficulty in meeting curriculum demands was also considered a difficulty by respondents to the EDC/BSI survey, and a survey conducted by the University of Michigan describes teachers' requests for guidance in identifying materials and curricula, specifically those that relate schoolyard activities to standards. Respondents to the National Wildlife Federation survey suggested that the NWF could best support schoolyard programs through funding and curriculum. The University of Massachusetts Extension survey reports that 75% of respondents with schoolyard learning programs connect activities to the MA curriculum framework, in particular, science and technology curriculum frameworks. In the University of Massachusetts

survey, teacher initiative was the single most important factor for the success of a school gardening program. However, this should be considered in light of the EDC/BSI finding that a single charismatic leader often serves as the catalyst for a project, but if support does not broaden the program has little chance of sustainability —a finding also reflected in the literature.

6. Summary and Conclusions: The State of Research on School Grounds

6.1 Revised Causal Pathways

The original impact model that guided the literature review and survey research proposed six characteristics of high-quality school grounds and eight impact hypotheses. The research did not disprove any of the hypotheses, although in several cases there was not enough information to support them. Furthermore, based on the literature review, the researchers felt that some of the impact hypotheses were better classified as design issues. While the proposed characteristics of good school grounds design are consistent with successful experiences (as described in the literature and survey) the characteristics as they are currently formulated may be too broad to be of practical use for those who actually design school grounds. The research (in particular the literature review) suggests a more complex causal pathway where different design elements of schoolyards, as well as other intervening factors, contribute to learning, often through intermediate outcomes. Table 4 is one possible illustration of the revised impact model.

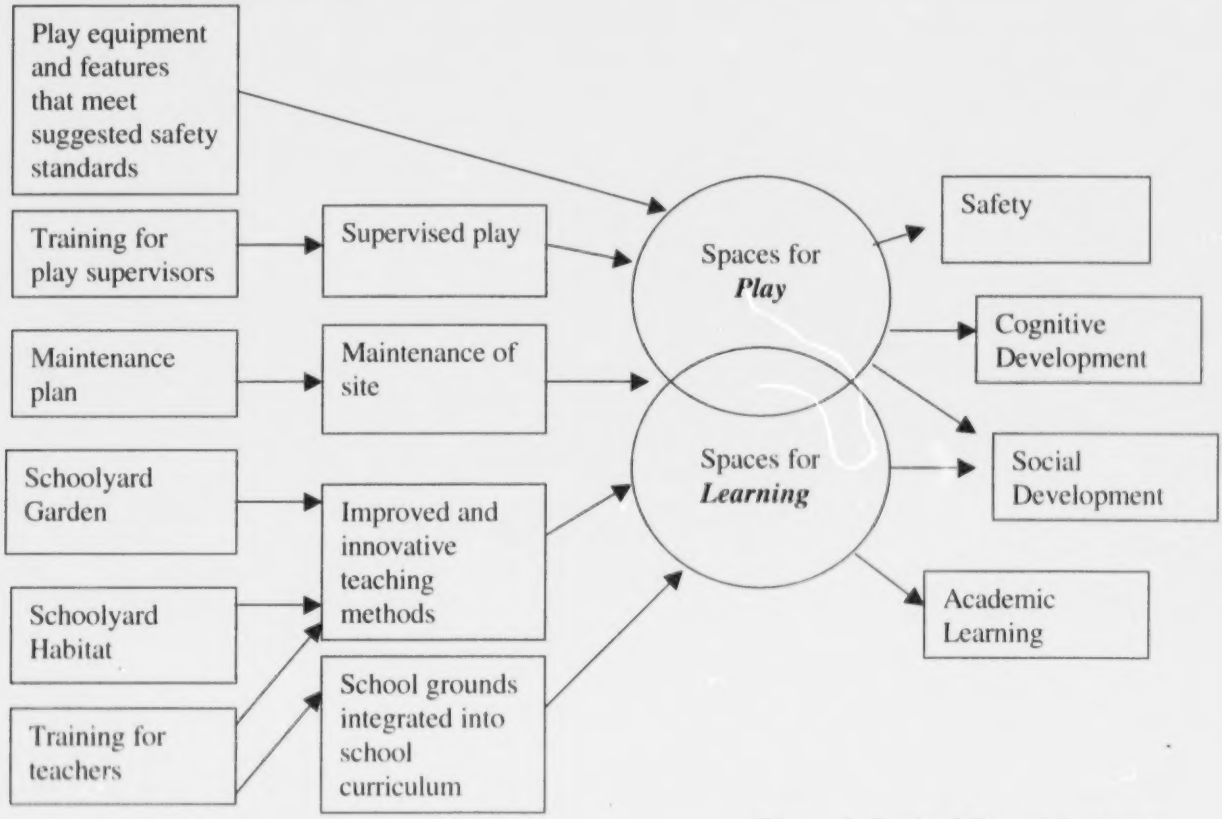

Figure 1: Revised Causal Pathways

6.2 Critique of Existing Knowledge

While there is enough descriptive data to hypothesize which design factors may have an impact on

learning, they remain just that— hypotheses. Further, literature varies in the degree to which it identifies specific design factors, and seldom relates a design factor to a particular impact with anything other than anecdotal or impressionistic data. A causal pathway is almost never supported with research involving control groups or with large-sample quantitative studies. Furthermore, much of the research does not focus specifically on school grounds. For example, the literature on cognitive development includes play that occurs on and off school grounds. The environmental education research examines the impact of learning through both school grounds and other natural habitat sites. The statistics on playground safety include injuries that occur in schoolyards, but also in other playgrounds and even private play spaces. In order to substantiate the hypotheses suggested by this literature review and survey, new research must be conducted that

1. focuses specifically on school grounds
2. includes a control group for comparison
3. has a large enough sample to conduct quantitative analysis of correlation between specific design features and their relative impact.

7. Next Steps: A Research Proposal

7.1 The Need for Data

Narrative case studies of individual schoolyard projects abound. Anecdotal evidence describes the benefits of schoolyards. Teachers and parents rave about students' newfound motivation. Children enthusiastically describe the activities they have engaged in. But in spite of the overwhelmingly positive reaction to schoolyard learning programs documented in the literature, actual broad-based studies that employ control groups are scarce. Yet key decision-makers need precisely this type of rigorous impact data in order to support continued school grounds improvements, to identify and refine best practice, and to ensure that more children receive the unique benefits of improved school grounds.

7.2 Meeting the Need

In order to substantiate the impact of school grounds, identify broader trends and patterns in school ground design, and relate specific design features to impacts, the researchers suggest a study that observes school sites over the course of an entire academic year. The study will include 30 schools that have participated in a school grounds project and currently have a schoolyard learning program; and 15 unimproved school grounds to form a comparison group. At 15 of the 30 schools with a schoolyard learning program, teams of principals, teachers and other interested personnel will participate in workshops and an ongoing mentoring program so that they can learn innovative and effective ways to incorporate the school grounds as a site for learning. Thanks to the presence of a control group, researchers and policy makers will be able to more clearly discern the impact of school grounds and training even in the first phase of research.

The study would address the following core questions:

1. *To what extent do improved school grounds have a positive impact on learning and child development?*
2. *To what extent do variations in school ground design explain variation in impact on learning and child development?*

7.3 Relating Design Features to Impact

The proposed study will examine the effects of school grounds in several key areas, including: academic learning, cognitive development, behavior and social development, and safety. The study will draw on the best existing research as well as design new indicators to assess impact in these areas. The control group will allow researchers to discern the extent to which observed benefits are attributable to the improved school grounds and the schoolyard learning program.

The proposed study surpasses existing research: first, by assessing impact in a statistically valid sample, including a control group, and second, by seeking to identify design factors that promote desired school ground learning outcomes. To this end, the researchers will develop a comprehensive typology of design elements including physical space and programmatic features found at each site. Researchers will use this typology to conduct an inventory of the participating school grounds and then use multivariate analysis to look for correlation between specific design features and observed impact.

In particular, the research will examine the role of teaching as a crucial design element by offering workshops and mentoring to participants from selected schools. This training intervention will allow researcher to explore the commonly held belief that improved school grounds realize their full potential as learning sites only when teachers have the skills to take immediate and frequent advantage of new teaching opportunities. Furthermore, the training materials designed for the workshops will be revised based on the results of the research, thereby creating a practical manual that will be of use to other practitioners.

7.4 Data Collection Tools and Techniques

In some cases, the researchers will draw on existing literature to develop impact indicators. Researchers will also operationalize useful concepts from the literature that haven't been well-defined in previous studies. Some impact data will be collected from school districts or individual schools. In other cases, classroom teachers will be asked to provide basic data. Finally, the study will rely heavily on observation checklists administered by graduate students specially trained to apply and score the research instruments.

Researchers will use a comprehensive typology to gather data on the design features at each school site. Once again, existing literature will be used to generate ideas but the final typology will be based on the sites included in the sample. The training intervention will be based on "best practice" from the literature, as well as the experience of BSI and community groups collaborating in the training. This design data will be gathered by graduate students familiar with the typology and trained to use the rating tool.

Table 4: Summary of Key Research Questions

Key Research Questions	**Key Terms and Concepts to be Operationalized**	**Possible Variables, Indicators and Measures**	**Notes on data collection**
To what extent do improved school grounds have a positive impact on learning? To what extent do variations in school ground design explain variation in impact on learning? <u>Additional research questions:</u> Which type(s) of impact is(are) most prominent? Which types of impact are correlated with other impacts? Which design features are most prominent? Which design features are correlated with other design features?	Academic Learning	grades, standardized testing, *(graduation rates college attendance)*	• Data gathered from school/district sources • Data gathered from classroom teachers • Data gathered through site visits, inventory • Data gathered through structured observation by trained "spotters"
	Cognitive Development	age appropriate play,	
	Behavior and Social Development	inclusive play groups, conflict resolution, environmental stewardship	
	Impact on Safety	injury data	

APPENDIX I

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APPENDIX II
Survey

SURVEY ON THE IMPACT OF SCHOOLYARD LEARNING PROGRAMS

Part I: General Information
1.1 Please provide your contact information:

Your name: _____
Title: _____
School /Program: _____
Address: _____
Phone: _____
E-mail: _____

1.2 Please indicate the location of schoolyard site(s):
☐urban ☐suburban ☐rural

1.3 We may wish to contact respondents whose program activities have particular relevance to our research. If we find yours to be one such program, may we phone you to discuss your program? ☐ Yes ☐ No

_____
(Please provide contact information for the month of July, if different from above.)

Part II: Description of Schoolyard Design and Activities

2.1 Please describe the nature of your schoolyard learning program and/or activities.
_____
_____
_____

2.2 Which academic subjects are taught through the schoolyard?
Please check all that apply:

☐Art
☐Civics education
☐Environmental education
☐History
☐Language arts
☐Math
☐Reading
☐Science
☐Other _____

2.3 On average, how many children participate in a typical schoolyard learning activity?

_____

2.4 What is the school grade of the children who participate in schoolyard learning activities? (*Please check all that apply*)

☐Preschool/Early Childhood	☐Kindergarten	☐1st	☐2nd
☐3rd	☐4th	☐5th	☐6th
☐7th	☐8th	☐9th grade and beyond	

2.5 Does your program specifically serve children who are economically disadvantaged? ☐Yes ☐No

2.6 Does your program serve a specific minority group (e.g. ethnic group, students with learning disabilities, students with physical disabilities)?

☐Yes *Please specify*_____

☐No

2.7 How many hours per week do students participate in these activities

...in school? _____ ...out of school? _____

2.8 To what extent do you collaborate with the community, including other educational programs? _____

_____

_____

2.9 What is the annual cost of your program *(in US dollars)*? _____

2.10 How is your program funded?

☐School budget

☐External sources *Please elaborate* _____

2.11 Please respond to the following statements by checking in the appropriate box.

	Yes	No
Our schoolyard design/activities are multi-use and multi-task.	☐	☐
Our schoolyard was designed through a participatory process.	☐	☐
Our schoolyard learning activities foster partnership with community organizations.	☐	☐
Our schoolyard learning activities are integrated into the educational (curriculum) planning process.	☐	☐
We have mechanisms in place to ensure the ongoing use of the schoolyard for integrated learning activities.	☐	☐
We have maintenance mechanisms/processes in place to ensure the sustainability of the schoolyard.	☐	☐

Please feel free to add comments or examples related to the preceding statements.

Part III: Impact of Schoolyard Learning Activities

Please respond to the statement in the white column with the numbers: 1 = Almost always, 2 = Frequently, 3 = Sometimes, and 4 = Almost never. ***In the following shaded columns, please check the type of supporting evidence you have for your response.***	Your response to the statement (1,2,3 or 4)	first-hand observation (of your program)	anecdotal evidence (of your program)	qualitative research (of your program)	quantitative research (of your program)	research from other programs
1. Our schoolyard learning activities have a positive impact on academic learning (as measured by improved performance on standardized achievement tests, improved mastery of curriculum standards).		☐	☐	☐	☐	☐
2. Our schoolyard learning activities contribute to the physical and psycho-social development of young children.		☐	☐	☐	☐	☐
3. Our schoolyard learning activities allow children to experience community service.		☐	☐	☐	☐	☐
4. Our schoolyard learning activities foster community participation in education, by enabling community members to participate in all aspects of schoolyard-related activities, including a participatory design phase.		☐	☐	☐	☐	☐
5. Our schoolyard learning activities have a positive impact on the learning environment, which stimulates improved teaching and learning.		☐	☐	☐	☐	☐
6. Our schoolyard learning activities foster greater environmental awareness among students.		☐	☐	☐	☐	☐
7. Our schoolyard learning activities foster greater environmental stewardship among students.		☐	☐	☐	☐	☐
8. Our schoolyard design reduces the likelihood of injuries.		☐	☐	☐	☐	☐
9. Our schoolyard design reduces the incidence of crime (e.g. delinquency, vandalism, trespassing) on campus.		☐	☐	☐	☐	☐
10. Our schoolyard learning activities promote cooperative and collaborative rather than negative, aggressive play.		☐	☐	☐	☐	☐
11. Our schoolyard design fosters activities that are inclusive with regard to ...gender		☐	☐	☐	☐	☐
...economic status		☐	☐	☐	☐	☐
...othnicity		☐	☐	☐	☐	☐
...physical ability		☐	☐	☐	☐	☐

BEST COPY AVAILABLE

12. What has been your greatest obstacle in implementing your program?

_____

_____

_____

_____

13. What has been the greatest benefit of the schoolyards program?

_____

_____

_____

_____

14. Do you have written documentation on the impact of your schoolyard learning activities in any of these areas that you would be willing to share with the researchers?

☐ Yes, I will send the information to the address below
☐ Yes, I will send the information electronically to <jmcleod@edc.org>
☐ No, I do not have written documentation to share with the study.

Thank you for participating in the survey.
Please return the survey to:

SCHOOLYARD INITIATIVE/GLOBAL LEARNING
EDUCATION DEVELOPMENT CENTER
55 CHAPEL STREET
NEWTON, MA 02458-1060

If you prefer, you may also complete the survey on-line at the EDC website: www.edc.org/GLG/.

APPENDIX III
Survey Data: Obstacles to Schoolyard Learning Programs

Funding and Time are the greatest obstacles respondents face in their schoolyard programs. Funding is mentioned twice as frequently as any other factor. Another concern is sustainability, particularly when a program depends heavily on one founder or charismatic leader who cannot sustain the program indefinitely without broader participation. Many respondents also cite support, willingness and skills of classroom teachers as an obstacle. Also notable is the fact that state standards and state and city agencies were generally seen as an impediment, rather than a source of support.

Illustrative Quotes: What has been the greatest obstacle in implementing your program?

- Lack of consistent support staff due to insufficient funding. Vandalism. The MCAS focus has scared many classroom teachers into not 'having time' to participate in outdoor learning.
- Gaining community support was difficult at first. People were unwilling to accept that troubled youth were extended privileges such as field trips, recreational activities, and public recognition for the positive things they were doing in the community.
- "Show me the money!"
- Lack of immediate knowledge. I have had to study and learn this area and have utilized the students' willingness to learn as we go. I am currently working on a broader base of community support. Funding is always an issue.
- As with all programs, money is the biggest concern in our area. Another obstacle is buses in our district. I have had to learn to drive a bus so I can take my students out on field trips. The pond project is another to do field work without have to bus students.
- participation uneven communication among all participants Misuse of facilities by public
- Integrating the program with the existing curriculum in a way that doesn't create undo extra work for teachers. Sustaining the effort.
- Money! Also, getting maintenance and the district to see the benefits of a garden. We are not just tearing up the playground!
- The inability of School District to coordinate and support our efforts. This is primarily because: 1.The School District lacks financial resources and 2.There is an awareness problem, that is, a perception that beautifully functional outdoor environments are "icing on the cake" rather than every child's right.
- This particular plot of land had been neglected and has a 50-year accumulation of glass and debris that we probably take another 50 years to completely eliminate.

APPENDIX IV

Survey Data: Benefits of Schoolyard Learning Programs

The majority of survey respondents listed multiple benefits of their schoolyard learning programs. Common responses alluded to the "intangible" benefits of student pride and motivation, as well as the opportunity to teach applied skills and social skills not easily taught in the traditional classroom.

Illustrative Quotes: What has been the greatest benefit of your program?

- The greatest benefit from my project has been seeing my love of the environment spread to my peers in school. Previously indifferent towards the environment, I frequently find my friends commenting on a bird they saw at the feeder or a pretty flower that just blossomed. It has definitely spread environmental awareness in school.

- Children can connect with their surroundings and thus feel connected to learning. That way, learning is not abstract, but personal. Children also think better and are more creative after being outdoors for a period of time.

- There are so many...stewardship of the earth, learning about plants and their products, working outdoors with children...increased environmental awareness in the students and pride in the grounds;

- The youth develop life skills that they may not necessarily get in a regular classroom setting. They are also given an alternative method of learning classroom lessons, such as math and geography.

- Recently and belatedly, we had our physical education teacher evaluate the recreational use of the schoolyard. He has restructured our activities so that they are more inclusive with respect to gender and physical ability. Also, the collaboration with Earthworks has been of great benefit.

- Students form bond with mentors. Mentors provide an opportunity for students to talk with an adult.

- Connections between the school and the community - intergeneration experience, great community support and learning for all involved -- children and adults

- Participants have a heightened sense of community. They have learned basic gardening using math and reading skills. Participants improve their self-esteem as they find meaning in what they are doing for others and for themselves.

- The greatest benefit is the respect and collaboration of the students for and with each other. They increase their risk taking by trying new foods. I believe that they increased their appetite for vegetables. The sunlight was so beneficial to our well being. We have no windows in the classroom and artificial lighting so I believe that the students' attitudes were affected by our involvement in the garden.

- The greatest benefit has got to be the sparkle in students eyes when they're working in the garden, when they see a seed sprout or a plant bloom, etc. Also, an exciting aspect has been when the parents of students come in and talk about how, for example, a student wanted to buy a pack of seeds to plant over saving for a 'toy they really wanted," how they've planted gardens at home as a result of interest sparked in school, how the students point out native or endangered plants to parents on hikes and tell them not to pick these, etc. These are things I think students take with them far beyond the classroom walls, past the unit assessments and standardized tests. These are the things learning really should be about...application in the real world.

- It has definitely resulted in creating a nurturing ground for students who may not do well in more conventional settings (both academic and behavioral) The pride of ownership and desire to help something grow has already seen growth in the individual. In addition, many of our children rarely have had a chance to actually participate in designing, planting or nurturing plant life. Their excitement comes through in their writing, their desire to find out more, and their sharing of the things that they are learning. Everyone takes pride in our garden and their part in it...a true community effort that has seemed to move into other areas of our school environment as well. We have a number of photos that we have taken of children planting, watering, etc.

APPENDIX V

Survey Research Summary Table

Author/ Institution	Number of Respondents	Response Rate	Portion of Sample with Program	Type of Questions	Population/ Sample	Ending Date
BSI/EDC	108	–	Virtually all –although not all are school sites	Likert, open ended, multiple choice,	(mixed, international, snowball)	August 2000
University of Michigan	537	537/2073		Largely multiple choice, a few open-ended,	Michigan Elementary Schools	Feb. 1999
National Wildlife Federation	131/426	31%	100% have certified Schoolyard Habitat	Open-ended	All Schoolyard Habitat Sites certified before January 1, 1999	(sent) April 1999
Project HOME (New Hampshire Fish and Game Department)	4763	75%	68% have an active program	Multiple choice, open-ended, likert scale	All schools trained through Project HOME (New Hampshire)	March 2000
"Garden in Every School"	334/2548	13.1%	174 (52%) have current gardening program, 141 (42%) are interested in starting such a project	Multiple choice/checklist	Public and private school principals	June 2000